WELL DECOMMISSIONING
ON THE LUMMI INDIAN RESERVATION
DURING 2009

Prepared for:

Water Resources Division
Natural Resources Department
Lummi Indian Business Council

Funded by:

Environmental Protection Agency
(Assistance Identification No. BG-97042602-3)

Prepared by:

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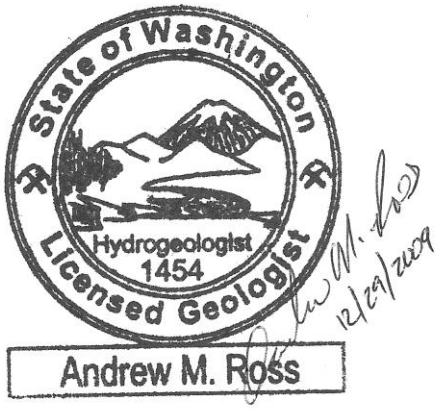
Salix Environmental Services



December 2009

This project has been funded wholly or in part by the United States Environmental Protection Agency under Assistance Agreement BG-97042602-3 to the Lummi Nation. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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1. INTRODUCTION

The Lummi Indian Reservation (Reservation) is located along the Western Boundary of Whatcom County in the northwestern part of Washington State (Figure 1). Ground water is the primary source for domestic, commercial, municipal, and industrial potable water supplies on the Reservation. Individual water supply wells (wells) that served one or more homes and/or facilities were the primary source of water supply prior to the formation of the Lummi Water District in the 1970s. Over time, many of these wells have been abandoned due to unsuitable water quality and/or as the Lummi Water District provided water to homes and other facilities. As an example, wells of the former Gooseberry Point Community and Water Association (now known as the Gooseberry Point Community Association), were transferred to the Lummi Indian Business Council (LIBC) as part of a water system integration project.

Contamination of Reservation ground water is one of the three potential nonpoint source impairments identified in the Lummi Nation Nonpoint Source Management Program (LWRD 2002). Abandoned wells that are not properly decommissioned could lead to direct contamination of ground water through conveyance of pollutants associated with storm water or through other means. Decommissioning of wells is consistent with actions identified in the Lummi Nation Nonpoint Source Management Program to address saltwater intrusion into Reservation aquifers (see Table 3.6 in LWRD 2002) and contamination of Reservation ground water (see Table 3.4 in LWRD 2002).

The Lummi Natural Resources Department (LNR) obtained a grant from the U.S. Environmental Protection Agency (EPA) to decommission abandoned water supply wells on the Reservation (Assistance Identification No. BG-97042602-3).

The well decommissioning effort was initiated during 2006 and seven wells were decommissioned during calendar year 2006. No wells were decommissioned during 2007 and five wells were decommissioned during 2008. This report is a summary of the well decommissioning effort conducted during the 2009 calendar year. This document is organized into six sections and has two appendices. This first section is the introduction, the second section describes the methods used to decommission the selected wells, the third section presents the results, the fourth section discusses the overall well decommissioning effort, the fifth section contains conclusions, and the sixth section lists the cited references. Appendix A contains the results of the evaluations performed on each well to determine if the well should be decommissioned. Appendix B contains the Water Well Decommissioning Reports completed by B&C Well Drilling for each decommissioned well.

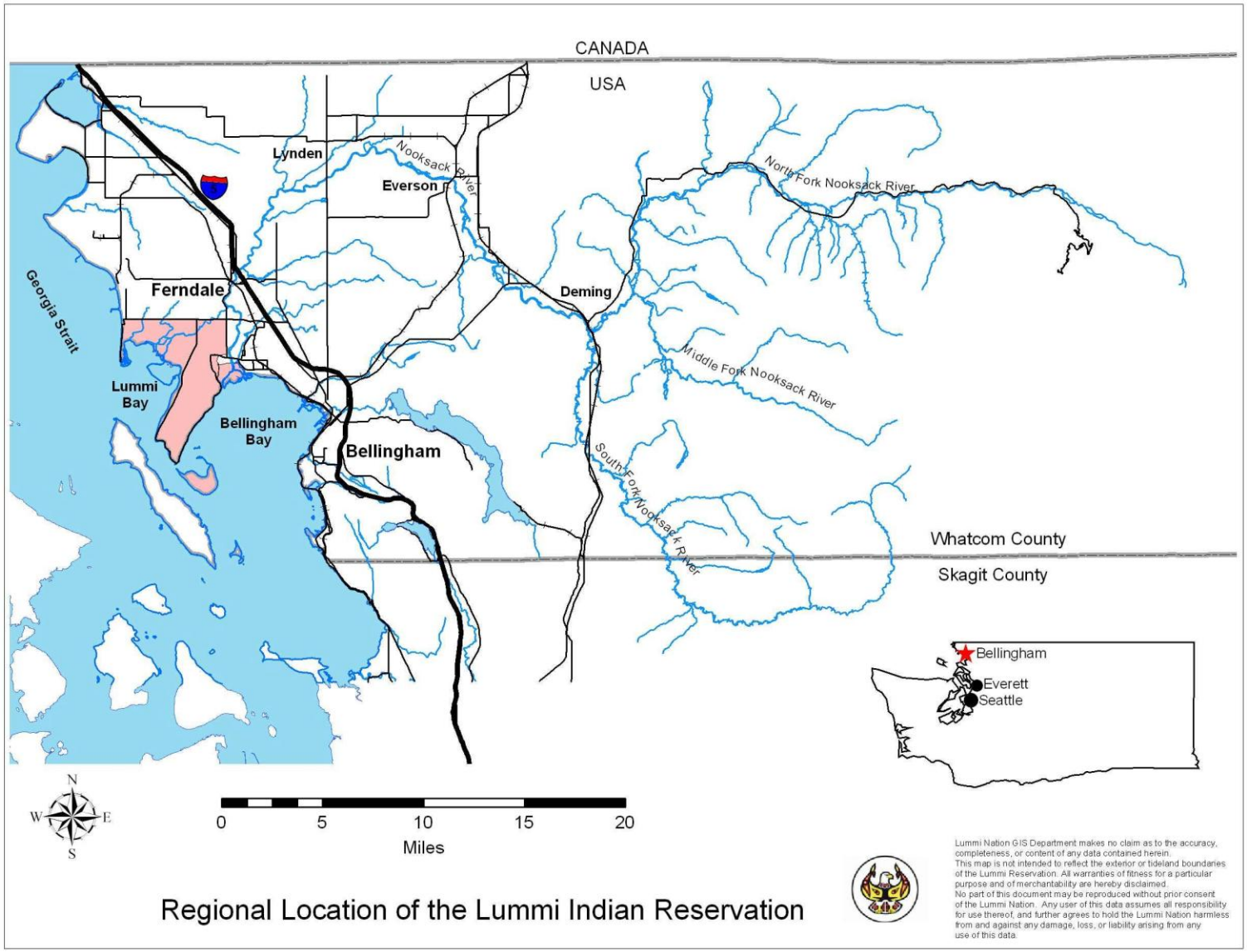


Figure 1. Regional location of the Lummi Indian Reservation.

2. METHODS

Contractors were used to conduct the well decommissioning activities during 2009. The Lummi Natural Resources Department (LWRD) selected B&C Well Drilling, Inc. (B&C) following a competitive bid process during 2006 to perform the decommissioning. Salix Environmental Services (Salix) had been contracted previously by the LWRD to provide water resources management and planning services and was tasked with providing logistical support, coordination, and documentation of the well decommissioning work performed by B&C.

The approach to decommissioning or improving water wells consisted of 1) identifying candidate wells and obtaining landowner permission, 2) evaluating each candidate well against criteria to determine if the well should be used as a monitoring well or decommissioned, and 3) decommissioning or improving selected wells.

During the fall of 2009, 38 wells were initially identified as candidates, of which 27 were evaluated further to determine feasibility of decommissioning them. Of the 27 examined further, nine appeared to be feasible candidates for work (decommissioning or improvement) in 2009, and five appeared to be feasible candidates for decommissioning in the summer of 2010. Reasons that wells were not considered feasible for decommissioning during 2009 included wells that were not abandoned, could not be located on the ground, and/or landowner permission could not be obtained in a timely manner. The primary issue with obtaining permission was that for most wells, there was more than one property owner, and typically there were many property owners. The five candidate wells postponed until the summer of 2010 were first identified in the fall during the wet season, making decommissioning in 2009 more difficult and expensive due heavy equipment having to travel and work on wet (soft) ground. The initial evaluation was led by Salix and guided by Victor Solomon (Supervisor, Lummi Water District) and Jeremy Freimund (Water Resources Manager, LWRD).

Of the nine wells that were feasible candidates for work in 2009, landowner permission(s) were obtained for only three wells. Evaluations of these three wells indicated that two of the wells should be decommissioned and one well maintained as a monitoring well with improvements to the well and application of a Sanitary Control Area. Appendix A contains the results of the evaluations[1]. Of the six wells still in the administrative process, three are substantially through the process, the other three at the initial stages. Administrative processing not completed in 2009 is due to not being able to obtain permission from landowners (permission has not been denied though) and work on these six wells should continue in 2010.

As part of the well decommissioning and improvement activities, well locations were identified in the Lummi Nation Geographic Information System (GIS), which includes locations provided by Licensed Surveyors or resource-grade Global Positioning System (GPS) coordinates for the three wells decommissioned or improved in 2009.

[1] Two other wells were evaluated to determine if they should be decommissioned or used as monitoring wells, but are not included in this Report because landowner permissions have not yet been obtained. It was believed at the time of the evaluation that landowner permission would be obtained in sufficient time to conduct the decommissioning or improvement work in 2009. These wells are two of the three substantially through the administrative process.

The well decommissioning procedures described in the Uniform Joint Technical Requirements adopted as Exhibit G of the settlement to the lawsuit, *United States, Lummi Nation v. Washington State Department of Ecology, et al*, Civil Action No. C01-0047Z (U.S. District Court, Western District of Washington) were used to decommission the wells. The Water Resources Manager reviewed and approved the decommissioning and improvement methods for the three selected wells. In general, drilled wells were decommissioned by removing all obstructions, perforating the casing, then placing a bentonite slurry from the bottom of the well to the top, followed by cutting the top of the casing off below the ground surface, placement of a secondary seal, and filling the area immediately over the well with topsoil. In one well located inside a building, unhydrated bentonite chips were poured into the well by hand, concrete placed at the top with an embedded metal plate indicating the well number. The third well was improved by installing surface seal and placement of a locking box on top of the well to house data recording equipment.

Figures 2 through 5 are pictures of the various steps of decommissioning a drilled well (they are not all pictures of the same well). Figures 6 and 7 shows the well improvement process—placement of a secondary seal and a locking housing welded onto the top of the well. Figure 8 illustrates a secondary seal.

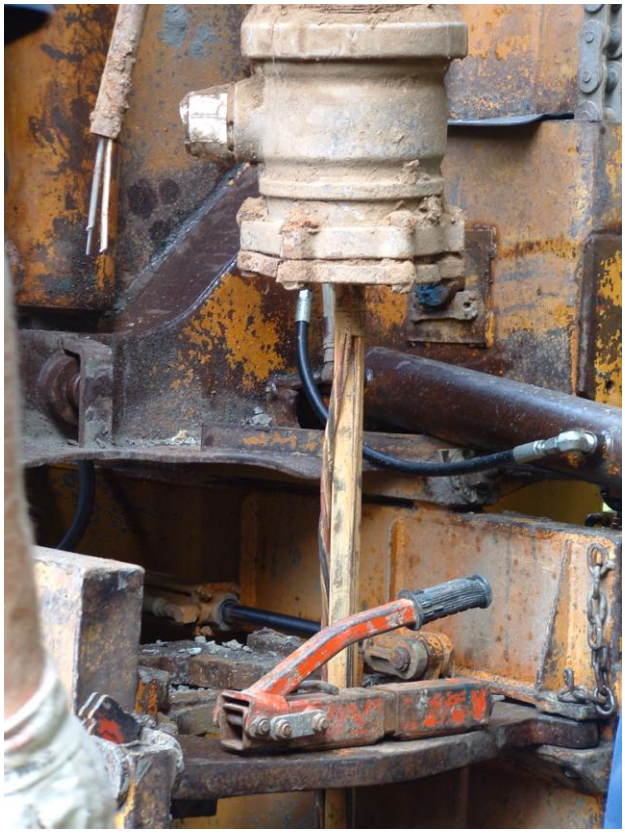


Figure 2. Removal of the pump and associated plumbing from a well (different wells). The lower picture shows a type of pitless adapter common to wells drilled in the 1970s. The bottom of the pitless adapter connected below grade to the top of a six inch diameter casing and at the top to a seven inch diameter casing that extended to 1.85 ft. above the ground surface (Well No. 89).

(a)


(b)

Figure 3. Well perforation operation shown in (a) and (b) shows the perforation tool (different wells).

(a)

(b)

Figure 4. Placement of bentonite slurry. Photo (b) shows unhydrated bentonite chips placed around the top of the casing near the end of placement of bentonite slurry into the well. This was done to eliminate dirt filling of the annular space that is part of the secondary seal.

(a)

Figure 5. Burial and final grade of the decommissioned well. Completion of the secondary seal (a) and final grade (b) (shovel marks location of the decommissioned well).

(a)

(b)

(c)

Figure 6. Overdrilling of well for placement of a surface seal. Photo (a) shows the overdrill tool, (b) the process of overdrilling, and (c) completion of the overdrill. The overdrill tool is 20 ft. long and 10 inches in diameter.

(a) (b)

Figure 7. Photos above (a) show completion of the surface seal and photos above (b) show placement of the locking cover to house water level recording equipment.

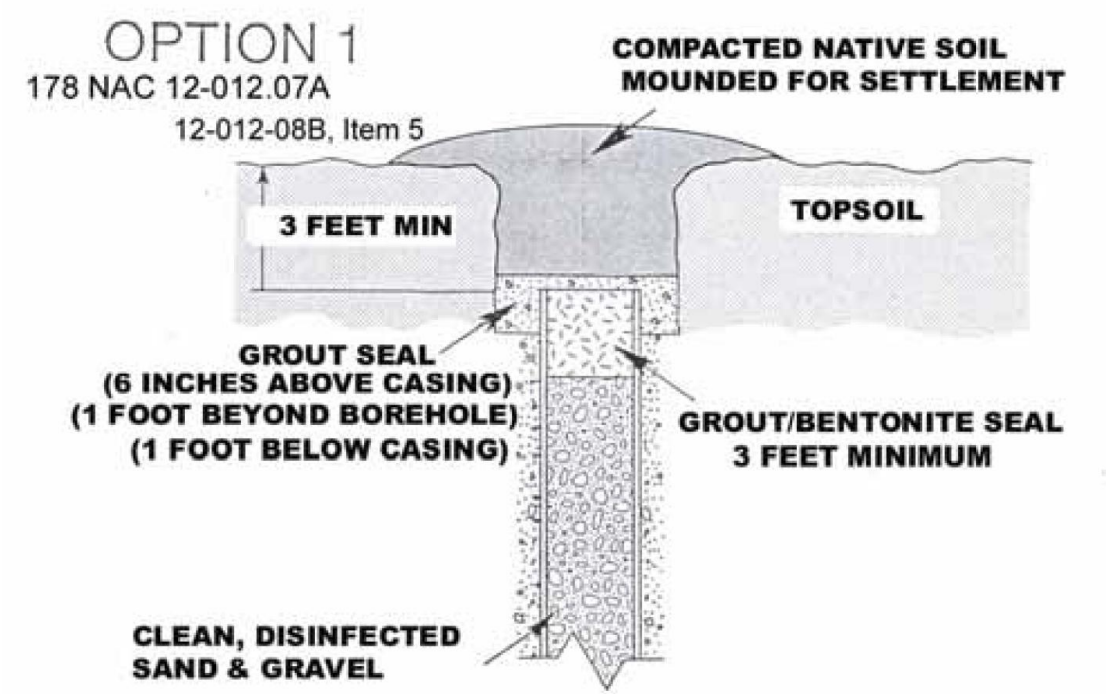


Figure 8. Illustration of secondary seal. The "Grout Seal" above is the 'secondary seal" that was utilized for well decommissioning (from Nebraska Health and Human Services, Title 178, Chapter 12, Figure 11).

3. RESULTS

Two wells were decommissioned and one well improved during 2009 (Table 1, Figure 9, Appendix A). This section provides summary documentation of the work on each of the three wells. Appendix B contains the Water Well Decommissioning Reports completed by B&C for each decommissioned well. Note that the weight of one "bag" of unhydrated bentonite or bentonite slurry is 50 lbs.

Table 1. List of wells selected to be decommissioned.

Lummi No.	TRS Code	Well Decommissioned or Improved?
37	38N/01E-12K01	Decommissioned
66	38N/01E-25J02	Improved
89	37N/01E-02M03	Decommissioned

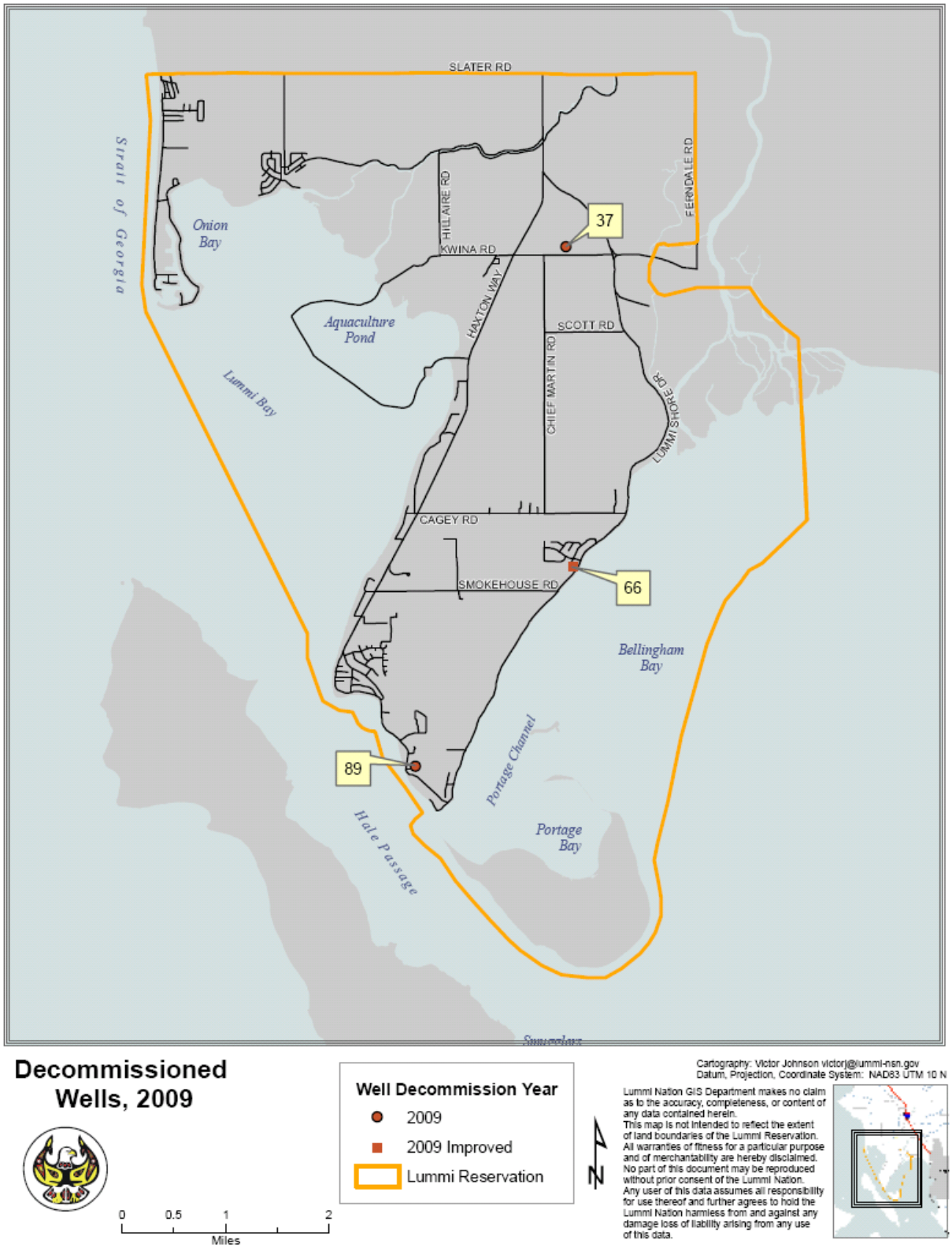


Figure 9. Locations of wells selected for decommissioning or improvement in 2009 on the Lummi Indian Reservation.

3.1. Well No. 37

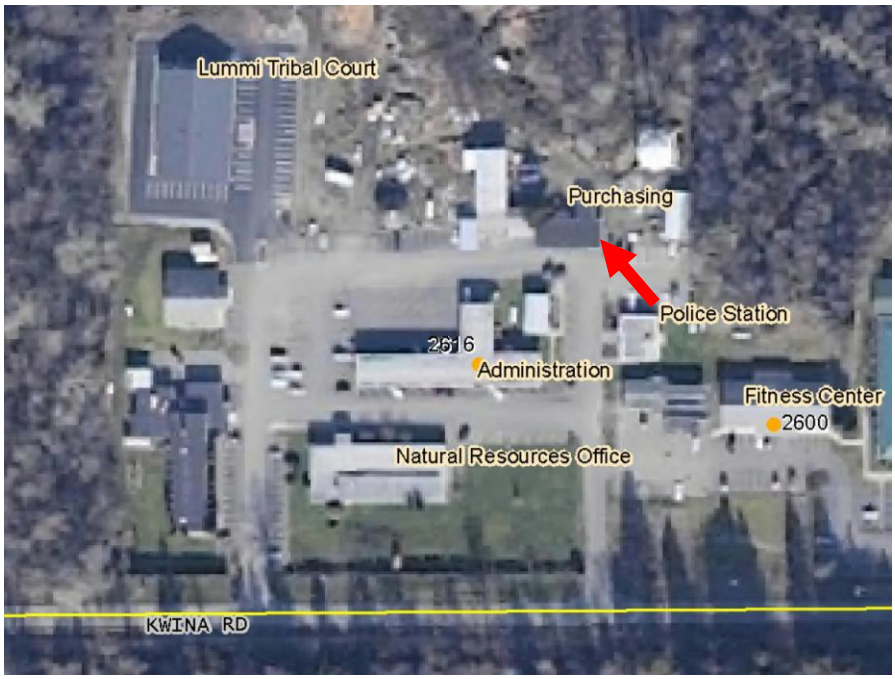
Well No. 37 is located inside a building used by Lummi Law and Order at the Tribal Center located at 2616 Kwina Road (see Figure 10 for location). Well No. 37 was selected for decommissioning because it was abandoned and was vulnerable to contamination due to a cap (metal plate) that did not seal and the wellhead's location at the level of the floor of the room (Appendix A). The Well Decommissioning Report (Appendix B) documents the decommissioning of the well. Figure 11 shows the well before and after decommissioning.

The location of the well inside a building prevented removal of obstructions in the well and placement of a bentonite slurry. The bottom of the well measured in 2009 was 49 ft. above the level reported in Cline (1974) of 160 feet (which Cline notes is a 1972 measurement). The original well log indicates a depth of 200 feet (both well logs in Appendix A). No plumbing was apparent in the upper 24.3 feet (static water level) of the well. The selected method for decommissioning was to pour unhydrated bentonite chips into the well by-hand. The ground water tapped by the well is saline and that portion of the Lummi Peninsula aquifer system is not used for potable water supplies.

About one-half of the estimated amount of unhydrated bentonite chips required to fill the well was used (48.5 bags used, 83.5 bags estimated to fill well). Based upon observation, the bentonite chips did not bridge in the upper 25 feet of the well and likely bridged at a greater depth. 21 days after placement of the bentonite chips, no settling of the bentonite had occurred at the top of the well and concrete 4 inches thick was placed at the top of the well. A metal plate with the identifier "Well 37" was placed into the top of the concrete at floor level. The plate will allow for identification of the well in the future.

During the evaluation of the well decommissioning method for this well, further methods of decommissioning were evaluated for use if the building in which the well is located was demolished. Two methods were evaluated, and both assumed a complete column of bentonite from the measured bottom (111.3 ft., which includes about 49 ft. of material at the base of the well). The first of the two methods discussed was that, minimally the upper 25 ft. of the well should be drilled out, the casing removed or perforated, and bentonite slurry placed into the well. The 25 ft. depth is based upon a change in lithology at 23 feet (see APPEDIX B). For the second method discussed, the entire well should be drilled out, the casing perforated, and bentonite slurry placed into the well from the bottom to the top. The 2009 decommissioning effort did not result in complete filling of the 111.3 ft. of the open well with bentonite, a bridge likely occurred somewhere lower than 25 ft. below the top of the well. Given this situation, the recommendation is to follow the second method evaluated if the building is demolished (i.e., drill out the entire well, perforate the casing, place bentonite slurry from bottom to top). This recommendation is based upon ground water protection and not issues that may relate to placement of a building on, or other uses of the site. Any other issues regarding future use of the site that could be affected by, and/or affect the well need be addressed by relevant professionals in consultation with the Water Resources Manager.

The orange paint mark on the edge of the wellhead visible in Figure 11 represents the point surveyed by Pacific Survey and Engineering working for Aspect Consulting, LLC as part of the Lummi Peninsula ground water study (Aspect, 2003).



(a)


(b)

Figure 10. Building inside which Well No. 37 is located. The red arrow in the aerial Photo (a) points to the building that contains the well and shows the orientation for Photograph (b). The well is located towards the back (north) of the building [approximately where the bottom of the "u" in "Purchasing" is located in (a)]. The red arrow points approximately northwest.

(a)

(b)

Figure 11. Well No. 37 before (a) and after (b) decommissioning.

3.2. Well No. 66

Well No. 66 is located close to a pole building at 2985 Lummi Shore Road. Well No. 66 was improved because it is an active, non-pumping monitoring well with one of the longest water level records on the Lummi Peninsula (Appendix A). The Well Decommissioning Report (Appendix B) documents the improvement of the well. Figure 12 shows the well before and after decommissioning (Figure 6 and 7 also shows the improvement process).

The pump and associated plumbing and wiring were removed, followed by the removal of the concrete-lined pit in which the well was located. A cap was then placed on the well and the upper 18 ft. of the well overdrilled with a ten inch diameter overdrill tool (the well is six inches in diameter). The annular space created by the overdrill was filled with 11 bags of unhydrated bentonite chips to within a few inches of the top of the well casing. The top of the well casing was about 1.46 feet below ground level. Another section of casing was then welded onto the top of the existing well casing, and the secondary seal was brought up to near ground level with 3 more bags of unhydrated bentonite chips, and the ground surface in the immediate vicinity of the well sloped so that water would not accumulate in the immediate vicinity of the well. Grass seed was then applied to the disturbed area and a large piece of concrete (visible in Figure 7a, bottom) placed to protect the well from impacts with vehicles. A well cap was placed on the well until the pre-fabricated metal box could be placed. Three weeks after placing the surface seal, a pre-fabricated locking metal box welded to the top of the well. A sanitary seal was placed at the top of the well and the box locked closed. Additional grass seed was applied to the disturbed area and the keys to the lock were provided to the Water Resources Division of the Lummi Natural Resources Department.

The Water Well Decommissioning Report form (Appendix B) for this well uses the pre-improvement measuring point, which was the western top side of the concrete pit that contained the well. The top of the casing was 1.46 ft. below the measuring point. The new top of casing is 3.90 ft. above the pre-improvement top of casing and 2.44 ft. above the old measuring point (the concrete pit had to be removed to improve the well). It should be noted that the new top of casing may or may not be where future water level measurements will be measured from, depending if the sanitary seal is used (i.e., is it removed for water level measurements). The sanitary seal is ½ inch thick. This well was also surveyed by Pacific Survey and Engineering working for Aspect Consulting, LLC as part of the Lummi Peninsula ground water study (Aspect 2003).

The change in elevation of the top of the casing should be noted in the LNR ground water database. This is because a one-time change in water level measurements (i.e., step-trend) before and after the improvements may be evident in the record that is strictly due to the imprecision of the measurement of the change in elevation of the top of the casing (which should be much less than ¼ inch).

(a)

(b)

(c)

Figure 12. Well No. 66 before (a, b) and after (c) decommissioning. The black arrows in the top two pictures (a) point to the location of the well.

3.3. Well No. 89

Well No. 89 is located beside 3230 Wekes Lane at the edge of a residential area. Well No. 89 was decommissioned because it was abandoned and located close to a home which posed a contamination threat, and because there was a cistern located under the rotting floor of the pumphouse that was also a threat to public safety (Appendix A). This well was evaluated for decommissioning in 2006, but decommissioning was not conducted at that time, nor again in 2008, because the power had not been disconnected from the well house by Puget Sound Energy. The Well Decommissioning Report (Appendix B) documents the decommissioning of the well. Figure 13 shows the well before and after decommissioning.

No problems were encountered decommissioning Well No. 89. The pumphouse was removed and hauled away, then the cistern was pumped dry, broken up, and most of it hauled away (some very large pieces of the bottom were left in place and buried. The well pump and associated plumbing and wiring were then removed. This included removal of the pitless adapter and the 7 inch casing that extended upwards from the pitless adapter to the surface (which resulted in the top of the 6 inch casing being approximately two feet below the ground surface). For perforation of the well, a six foot section casing was welded to the top of the exposed casing to temporarily raise the top of the casing above the ground surface. Raising the top of the casing eliminated dirt and debris entering the well from the ground surface during perforation.

The entire length of casing below where the pitless adapter had been located was perforated, then two bags of unhydrated bentonite chips were poured into the well to seal the screened interval. 11.5 bags of bentonite slurry were then placed from the bottom of the well to the top, and the level of the slurry was maintained at or near the top of the casing during the withdrawal of the tremie (drillstem). After the entire drillstem had been removed from the well, a bag of unhydrated bentonite chips was placed into the slurry and a plate attached to the drillstem was used to push the bentonite column down 20 feet. The six foot section of temporary casing was then removed, two bags of unhydrated bentonite chips placed around the top of the casing, and the well refilled with bentonite slurry to within 2 ft. of the top of the casing. After the bentonite stabilized in the well, four bags of unhydrated bentonite chips were added to the upper portion of the casing as well as over and the top of the casing to create the secondary seal. Topsoil was then placed over the hole and grass seed was not applied at the request of the landowner (they were planning to landscape the area themselves).

(a)

(b)

Figure 13. Well No.89 pumphouse and well before (a) and after (b) decommissioning. The yellow arrow shows the location of the well in the inset photo in (a), and the shovel marks the location of the decommissioned well in (b).

4. DISCUSSION

Two wells were decommissioned and one well improved during 2009, bringing the total to 14 wells decommissioned and one monitoring well improved since 2006 (Figure 14). Overall, the well decommissioning effort conducted during 2009 was successful, removing three potential sources of contamination to Reservation aquifers. Another benefit of the well decommissioning effort was increasing community awareness about the location of wells and protecting ground water.

The 2009 well decommissioning effort did not proceed more smoothly than the 2006 or 2008 efforts, due primarily to difficulties obtaining permission from property owners. In most cases, there were more than two, and often many more property owners for an individual property. This significantly increased the time required to consider wells for decommissioning. Increased time is required to process properties with multiple owners, and work should continue in 2010 on the six wells that did not make it through the administrative process in 2009.

Limitations to the process of decommissioning Well No. 37 lead to an incomplete decommissioning of the well (though it did significantly improve the level of protection to ground water). If the building that contains Well No. 37 is demolished, further decommissioning of the well as previously discussed in Section 3.1 needs to occur. In addition, the change in the measuring point elevation for Well No. 66 should be input into the LNR ground water database with note that the measuring point elevation changed, which may result in a minor "step-trend" in the water level data.

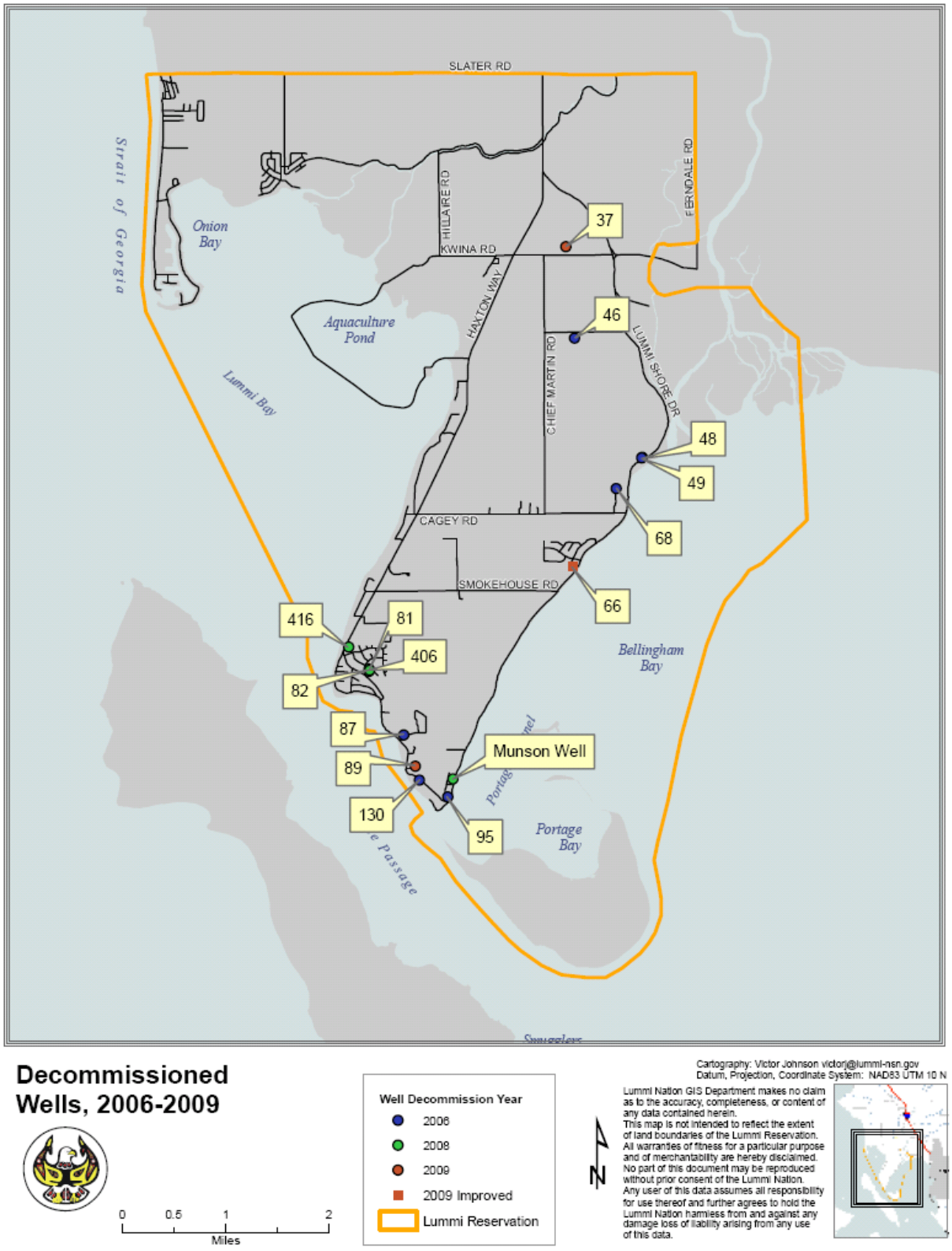


Figure 14. Wells decommissioned or improved in 2006, 2008, and 2009 on the Lummi Indian Reservation.

5. CONCLUSION

Two wells were decommissioned and one monitoring well improved on the Reservation during 2009 bringing the total to 14 wells being decommissioned and one improved since 2006. As described in the Lummi Nation Non-Point Source Assessment (LWRD 2001) and the associated Non-Point Source Management Program (LWRD 2002), wells are a potential source of contamination to Reservation aquifers. Well decommissioning is a direct and effective method to eliminate potential contamination of Reservation aquifers. Additional wells remain to be decommissioned. The well decommissioning program should be continued.

6. REFERENCES

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APPENDIX A. WELL DECOMMISSIONING EVALUATIONS

WORKSHEET FOR DETERMING IF ABANDONED WATER WELLS SHOULD BE MONITORING WELLS OR DECOMISSIONED

Criteria to determine if abandoned wells should be decommissioned or become candidates for use as a monitoring well. If the answer for questions 1 through 7 is "yes" then the well is a candidate for use as a monitoring well.

Well number, owner, and street address: *Lummi No. 37, LIBC, 2616 Kwina Road*

Person performing determination and date: *Andrew M. Ross, Sept. 10, 2009*

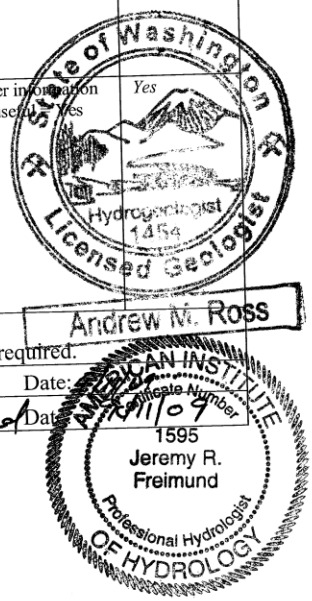
Criteria Description	Sub-category/ Explanation	Actual Well Information	Evaluation	Answer (Yes or No)
1. Is the well in good condition?	Good, not good, or unknown. In rare situations, unknown condition may not preclude use as a monitoring depending upon location of the well and if sufficient information can be gathered about its condition.	*Unknown. Bottom 48.7 feet of well filled in. Well casing exposed at floor level with crack in concrete originating at well.*	Good condition = Yes If unknown but important location and sufficient information gathered about condition = Yes Otherwise = No	*No*
2. Is the well unlikely to be a source of ground water contamination now or in the foreseeable future?	For example, is the well located at the bottom of a local depression?	*Yes, located inside building and exposed at floor.*	Unlikely to be a source of contamination = Yes Otherwise = No	*No*
3. Is the well located a sufficient distance from current and foreseeable sources of contamination?	Case-specific. In general, are sources of contamination located or likely to be proximate to the well (e.g., septic tank, gas station).	*Located inside building and exposed at floor level. Potential for contaminants to enter well.*	Sources of current and foreseeable contamination unlikely to be proximate to the well = Yes Otherwise = No	*No*
4. Is the well unlikely to be influenced by factors which diminish the utility of the well to serve as a monitoring well?	For example, is the well shallow and close to home with a foundation drain?	*Potential for water quality influence (see above).*	Unlikely that well influenced by factors that diminish use as a monitoring well = Yes Otherwise = No	*No*
5. Is the well suitable for use as a monitoring well?	For example, is the well conducive to water level measurements or obtaining water quality measurements? Both water level and quality are not necessary, depending upon the location of the well.	*Unknown. Bottom currently 48.7 ft. above reported well depth. However, source of historic water level measurements. Brackish water encountered at depth of 200' when well originally drilled (finished well 160 ft. deep).*	Suitable for use as a monitoring well = Yes Otherwise = No	*No*
6. Is there a Well Log for the well?	• Well dimensions known? • Water level, production known? • Well construction details known? • Stratigraphy recorded and reliable? Not all information is necessary, depending upon location and need for monitoring well.	*Yes, limited, from the 1974 Cline Report and one page (cover) of USGS well log.*	Sufficient information in well log = Yes Otherwise = No	*No*
7. Does the well tap an aquifer where additional information would be useful?	For example: • The aquifer is not tapped by other wells. • Are wells that tap the aquifer proximate or distant? • There is access to other wells that tap the aquifer. • Are aquifer characteristics or uses sufficiently variable or unique to warrant an additional monitoring well?	*Aquifer not currently monitored. Well will have to replaced if monitoring desired in this area. Aquifer not utilized in area.*	Additional aquifer information at well location useful = Yes Otherwise = No	*Yes*

Check the appropriate result:

X decommission well, ☐ candidate for use as monitoring well, or ☐ further information is required.

Assessment Completed by: Andrew M. Ross Date: 9/11/09

Concurrence by Water Resources Manager, (Yes) No (circle one): Jeremy Freimund Date: 9/11/09

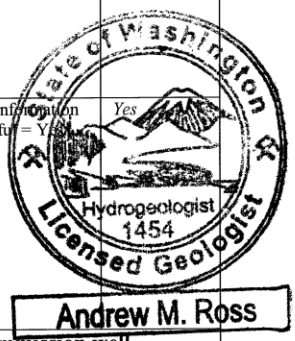


WORKSHEET FOR DETERMING IF ABANDONED WATER WELLS SHOULD BE MONITORING WELLS OR DECOMISSIONED

Criteria to determine if abandoned wells should be decommissioned or become candidates for use as a monitoring well. If the answer for questions 1 through 7 is "yes" then the well is a candidate for use as a monitoring well.

Well number, owner, and street address: *Lummi No. 66, Pierre, 2985 Lummi Shore Road*
Person performing determination and date: *Andrew M. Ross, Sept. 10, 2009*

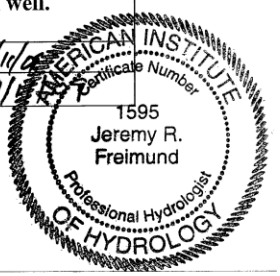
Criteria Description	Sub-category/ Explanation	Actual Well Information	Evaluation	Answer (Yes or No)
1. Is the well in good condition?	Good, not good, or unknown. In rare situations, unknown condition may not preclude use as a monitoring depending upon location of the well and if sufficient information can be gathered about its condition.	*Unknown. If wellhead improved and surface seal installed, likely good. Has been and continues to be a water level monitoring well.*	Good condition = Yes If unknown but important location and sufficient information gathered about condition = Yes Otherwise = No	*No, unless wellhead improved and surface seal installed.*
2. Is the well unlikely to be a source of ground water contamination now or in the foreseeable future?	For example, is the well located at the bottom of a local depression?	*Likely with current arrangement. Unlikely with upgrade to wellhead and application of Sanitary Control Area (SCA).*	Unlikely to be a source of contamination = Yes Otherwise = No	*No, unless wellhead upgraded and SCA applied.*
3. Is the well located a sufficient distance from current and foreseeable sources of contamination?	Case-specific. In general, are sources of contamination located or likely to be proximate to the well (e.g., septic tank, gas station).	*Yes if sanitary control zone applied and wellhead upgraded. Homes in proximity and well adjacent to pole building.*	Sources of current and foreseeable contamination unlikely to be proximate to the well = Yes Otherwise = No	*No, unless SCA applied.*
4. Is the well unlikely to be influenced by factors which diminish the utility of the well to serve as a monitoring well?	For example, is the well shallow and close to home with a foundation drain?	*Unlikely if wellhead upgraded.*	Unlikely that well influenced by factors that diminish use as a monitoring well = Yes Otherwise = No	*No, unless wellhead upgraded.*
5. Is the well suitable for use as a monitoring well?	For example, is the well conducive to water level measurements or obtaining water quality measurements? Both water level and quality are not necessary, depending upon the location of the well.	*Yes*	Suitable for use as a monitoring well = Yes Otherwise = No	*Yes*
6. Is there a Well Log for the well?	• Well dimensions known? • Water level, production known? • Well construction details known? • Stratigraphy recorded and reliable? Not all information is necessary, depending upon location and need for monitoring well.	*Yes, limited, from the 1974 Cline Report.*	Sufficient information in well log = Yes Otherwise = No	*No, unless wellhead upgraded.*
7. Does the well tap an aquifer where additional information would be useful?	For example: • The aquifer is not tapped by other wells. • Are wells that tap the aquifer proximate or distant? • There is access to other wells that tap the aquifer. • Are aquifer characteristics or uses sufficiently variable or unique to warrant an additional monitoring well?	*Yes. Long-term record for this well (since at least 1971).*	Additional aquifer information at well location useful = Yes Otherwise = No	*Yes*



Check the appropriate result: **Note: If wellhead not upgraded and SCA not applied, decommission well.**
☐ decommission well, **X** candidate for use as monitoring well, or ☐ further information is required.

Assessment Completed by: Andrew M. Ross Date: 9/10/09

Concurrence by Water Resources Manager, (Yes) No (circle one): Jeremy Freimund Date: 9/



WORKSHEET FOR DETERMING IF ABANDONED WATER WELLS SHOULD BE MONITORING WELLS OR DECOMISSIONED

Criteria to determine if abandoned wells should be decommissioned or become candidates for use as a monitoring well. If the answer for questions 1 through 7 is "yes" then the well is a candidate for use as a monitoring well.

Well number, owner, and street address: *Lummi No. 89, Ralph Solomon, 3230 Wekes Lane*
Person performing determination and date: *Andrew M. Ross, October 29, 2006*

Criteria Description	Sub-category/ Explanation	Actual Well Information	Evaluation	Answer (Yes or No)
1. Is the well in good condition?	Good, not good, or unknown. In rare situations, unknown condition may not preclude use as a monitoring depending upon location of the well and if sufficient information can be gathered about its condition.	*Unknown, pumphouse in poor condition.*	Good condition = Yes If unknown but important location and sufficient information gathered about condition = Yes Otherwise = No	*No*
2. Is the well unlikely to be a source of ground water contamination now or in the foreseeable future?	For example, is the well located at the bottom of a local depression?	*No apparent issues other than proximity to existing home. Wellhead is a few feet above elevation of home and outside of yard.*	Unlikely to be a source of contamination = Yes Otherwise = No	*No*
3. Is the well located a sufficient distance from current and foreseeable sources of contamination?	Case-specific. In general, are sources of contamination located or likely to be proximate to the well (e.g., septic tank, gas station).	*Proximity to existing home a potential problem.*	Sources of current and foreseeable contamination unlikely to be proximate to the well = Yes Otherwise = No	*No*
4. Is the well unlikely to be influenced by factors which diminish the utility of the well to serve as a monitoring well?	For example, is the well shallow and close to home with a foundation drain?	*No*	Unlikely that well influenced by factors that diminish use as a monitoring well = Yes Otherwise = No	*Yes*
5. Is the well suitable for use as a monitoring well?	For example, is the well conducive to water level measurements or obtaining water quality measurements? Both water level and quality are not necessary, depending upon the location of the well.	*Unknown*	Suitable for use as a monitoring well = Yes Otherwise = No	*No*
6. Is there a Well Log for the well?	• Well dimensions known? • Water level, production known? • Well construction details known? • Stratigraphy recorded and reliable? Not all information is necessary, depending upon location and need for monitoring well.	*Not sure. Existing log identified for well indicates 6 inch casing, 8 inch casing above ground.*	Sufficient information in well log = Yes Otherwise = No	*No*
7. Does the well tap an aquifer where additional information would be useful?	For example: • The aquifer is not tapped by other wells. • Are wells that tap the aquifer proximate or distant? • There is access to other wells that tap the aquifer. • Are aquifer characteristics or uses sufficiently variable or unique to warrant an additional monitoring well?	*Other wells in area more suited as monitoring wells.*	Additional aquifer information at well location useful = Yes Otherwise = No	*No*

Check the appropriate result:
X decommission well, ☐ candidate for use as monitoring well, or ☐ further information is required

Assessment Completed by: [signature] Date:

Concurrence by Water Resources Manager: Yes No (circle one) Date: 11/6/06

State of Washington
Hydrogeologist
1454
Licensed Geologist
Andrew M. Ross

AMERICAN INSTITUTE OF HYDROLOGY
Certificate Number
1595
Jeremy R. Freimund
Professional Hydrologist

APPENDIX B. INDIVIDUAL WELL DECOMMISSIONING REPORTS

WATER WELL DECOMMISSIONING REPORT

Lummi Indian Business Council – Lummi Water Resources Division

Lummi Well No: 37 TRS Code: 38N/01E-12K01
Lummi Well Permit No: NA
Other Identification: NA
Well Log Attached? ☒ Yes ☐ No ☐ Not Available

Use of Well: ☐ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☒ Other: Unused

Reason for decommissioning: Abandoned

Dimensions of Well: Measured diameter of well 10 (in.) Measured depth of well 111.3 (ft.)

Construction/ Condition of Well: (MP = Measuring Point)
Casing material: Steel
Casing joint type: Welded
Surface seal present: ☐ Yes ☐ No ☒ Unknown
Surface seal condition: UKN
Screen Interval: UKN
Pump and associated materials present? ☐ Yes ☒ No
Depth of pump intake from MP: NA (feet)
Manufacturer: NA Type: NA H.P. NA
Type of plumbing (i.e., pitless): NA
Other:

Obstructions:
☐ All obstructions removed:
☐ Pump, motor, drop pipe, wiring, & associated materials removed.
☐ Other:
☐ No obstructions were present in well at time of inspection.
☒ Not all obstructions removed. Provide explanation and how addressed during decommissioning in "Decommission Procedure" section.

Static Water Level: (Provide units for all measurements)
Water Level below (MP) (within approx.10 min.) and time:
24.35 at 11:57 (time)
24.35 at 11:58 (time)
24.35 at 12:00 (time)
Date of water level measurements: 11/20/05
Elevation of MP above mean sea level: 46.882
MP Description: Top of Casing-Flanged
MP Elevation above (+) or below (-) land-surface: 0
Land-surface elevation above mean sea level: 46.82
Sources of MP and/or land surface elevation AND potential influences on water level: LNR-Database LiDAR + obstruction in well

Water Quality: Water quality sampled? ☐ Yes ☐ No. If yes, attach results on separate sheet.
Water quality issues with well? (Provide sources): reported saline on well log

Well Production While In Service:
Typical production: UKN (gal/min.)
Drawdown: (feet) after hours.
Recovery: (feet) after (provide units)
Source (measured, estimated, owner/operator, documented, verbal, attach additional information):
Maximum production: (gal/min.)
Drawdown: (feet) after hours.
Recovery: (feet) after (provide units)
Source (measured, estimated, owner/operator, documented, verbal, attach additional information):
Changes and causes in production over life of well?

Property Owner Name(s): Lummi Indian Business Council
Location:
Well Street Address: 2616 Kwina Rd Bellingham WA 98226
Section, Township, Range: NW 1/4-1/4 SE 1/4 Section 12 Township 38N Range 1E
Latitude/ Longitude: Lat. N48.29513 Long. W122.62142 (provide units to decimal degrees or minutes)
Source of latitude and longitude: LNR Database
☐ USGS Quadrangle Map ☐ High Resolution Aerial Image
☐ Conventional survey
☐ Global Positioning System (GPS) Survey ☐ Mapping Grade GPS ☐ Recreational Grade GPS
GPS Accuracy: ± NA feet
Aerial Image source: NA
Aerial Image resolution: NA (provide units)
Record datum if not WGS 84:
Tax Parcel No. 380112259198 Assignment No. T-1004

DECOMMISSION PROCEDURE

Document method(s) of well decommissioning, including, but not limited to, methods of placement of sealing material, sealing materials used, quantity of sealing materials used, locations of sealing materials, location and resolution of obstructions that could not be removed, and treatment of well and ground surface at and near the ground surface.
USE ADDITIONAL SHEETS IF NECESSARY.

Material	From (ft)	To (ft)
Not all obstructions removed Due to Location inside bldg bottom of well 49' above reported bottom of well (1972)		
Filled borehole with 3/8 bentonite chips Topped with Cement + steel ID plate		
ID as "well 37"		
48.5 bag 3/8 bentonite chips		
Approximately 1/2 the		
expected amount of bentonite		

Start Date: 11/20/05 Completed Date: 12/11/05

WELL DECOMMISSIONING CERTIFICATION: I decommissioned and/or accept responsibility for decommissioning of this well, and its compliance with all acceptable well decommissioning standards for the profession. Materials used and the information reported above are true to the best of my knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print): Bill Clothier
Driller/Engineer/Trainee Signature:
Driller or trainee License No: 0085
If TRAINEE, Driller's Licensed No:
Driller's Signature:

Drilling Company: B + C Well Drilling
Address: 888 Kelly
City, State, Zip: Bellingham WA
Contractor's Registration No: BCWELDP947P Date: 12/22/05

The Lummi Indian Business Council does NOT warranty the Data and/or Information in this Well Decommissioning Report.

TABLE 3.--Materials penetrated by wells--Continued

Material	Thickness (feet)	Depth (feet)
Well 20. Benjamin Hillaire. Drilled by Dahlman Pump and Supply, 1971. Casing: 6-inch to 237 ft. Screen: .010-inch slot, 237-247 ft. Well depth, 247 ft.		
Clay, brown, and gravel	14	14
Clay, gray, and gravel	26	40
Clay, sandy, gray	12	62
Clay, sandy, brown	18	80
Clay, sandy, brown, and gravel (dry)	10	90
Clay, sandy, fine	17	107
Sand, fine (dry)	9	116
Sand, coarse, and gravel (dry)	8	124
Sand	2	126
Clay, sandy, gray	84	210
Clay, sandy and silty, gray	15	225
Sand, fine, and gray clay	32	257
Clay, hard, gray	28	285
Sandstone, gray	45	330
Well 21. James Joseph. Dug by Ward Sharp, 1964. Casing: 36-inch to 40 ft.		
Loam, sandy	3	3
Hardpan and clay	15	18
Clay, blue	22	40
Well 22. James Joseph. Dug by Ward Sharp, 1964.		
Loam, sandy	3	3
Clay, gravelly, gray	16	19
Clay, blue	29	48
Clay, sandy, gray	16	64
Well 23. Agnes Cagey Estate. Dug by Ward Sharp, 1964. Casing: 36-inch to 28 ft.		
Loam, sandy	3	3
Gravel	8	11
Clay, blue	17	28
Well 25. Sarah James. Drilled by Hayes, 1964. Casing: 6-inch to 20 ft (was pulled back to 20 ft). Well depth, 20 ft.		
Sand, silty, tan	5	5
Clay, tan (some water at 15 ft in sand)	15	20
Clay, gray	55	75
Clay, shaley, white	3	78

Material	Thickness (feet)	Depth (feet)
Well 32.--Continued		
Clay and some sand	4	32
Clay, gray	10	42
Clay, gray, and medium to coarse gravel (coarser and more plentiful with depth)	10	52
Well 33. Lummi School. Dug 1933. Casing: 54-inch.		
Sand	18	18
Well 35. Harold James. Dug by Norbert James, Sr., 1958. Casing: 48-inch to 12 ft (?).		
Sand	12	12
Well 37. U.S. Navy. Drilled by Bezona, 1952. Casing: 10-inch. Well depth (1972), 160 ft.		
Sand, fine (water 3-23 ft)	23	23
Clay, silt, and a few pebbles	177	200
Sand, fine (brackish water) at 200 ft	--	--
Well 38. Eva Kinley. Drilled by Dahlman Pump and Supply, 1971. Casing: 6-inch.		
Topsoil and brown clay	9	9
Clay, blue, with sand and fine gravel	246	255
Well 40. U.S. Navy. Drilled by Livermore, 1952. Casing: 6-inch to 75 ft.		
Topsoil	2	2
Sand, fine, muddy (water)	13	15
Clay, soft, muddy, dark	7	22
Clay, gumbo, sticky, black	8	30
Clay, gumbo, sticky, black, and clam shells	5	35
Clay, gumbo, sticky, black	22	57
Clay, dark blue	3	60
Clay, gray, hard	15	75
[Sand?] thin water streak at 75 ft	--	--

56

31

Cline, 1974

37

28N/01E-12 KOL

— 37 38N/01E-12K01 —

9-185—July 1935
Revised

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

1941-1185

WELL SCHEDULE

38/1-12K1

Date June 24, 1952 Field No.

Record by SES Office No.

Source of data Obs & dr.

1. *Location:* State Wash County Whatcom
Map Blaine
SW ¼ SE ¼ sec. 12 T 38 N R 1 E W
2. *Owner:* U.S. Navy Address
Tenant Address
Driller Bezona & Son Address Ferndale
3. *Topography* low terrace
4. *Elevation* 42 ft. above below MSL
5. *Type:* Dug, drilled, driven, bored, jetted June 1952
6. *Depth:* Rept. 200 ft. Meas. ft.
7. *Casing:* Diam. 10 in., to in., Type
Depth ft., Finish
8. *Chief Aquifer* From ft. to ft.
Others (24.67) OVER
9. *Water level* 38.86 ft. rept. meas. June 24 1952 above below Top
of casing which is 2± ft. above below surface
10. *Pump:* Type Capacity G. M.
Power: Kind Horsepower
11. *Yield:* Flow G. M., Pump G. M., Meas., Rept. Est.
Drawdown ft. after hours pumping G. M.
12. *Use:* Dom., Stock, PS., RR., Ind., Irr., Obs.
Adequacy, permanence
13. *Quality* Saline Temp °F.
aste, odor, color Sample Yes No
Unfit for
14. *Remarks:* (Log, Analyses, etc.)
Top of casing 47.7 elev. (assumed datum) which was reported to be 6' above USC&GS datum.

12
K1

U. S. GOVERNMENT PRINTING OFFICE 6—7473

Reconditioned

WATER WELL ~~DECOMMISSIONING~~ REPORT

Lummi Indian Business Council – Lummi Water Resources Division

Lummi Well No: 66 TRS Code: 38N/01E-25B02
Lummi Well Permit No: NA
Other Identification: NA
Well Log Attached? ☒ Yes ☐ No ☐ Not Available

Use of Well: ☐ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☒ Other: Monit-

Reason for decommissioning: Reconditioned Well improvement Sanitary Seal Locking Cap

Dimensions of Well: Measured diameter of well 6 (in.) Measured depth of well NA (ft.)

Construction/ Condition of Well: (MP = Measuring Point)
Casing material: Steel
Casing joint type: welded
Surface seal present: ☒ Yes ☐ No ☐ Unknown
Surface seal condition: Good
Screen Interval: 91-96
Pump and associated materials present? ☒ Yes ☐ No
Depth of pump intake from MP: 62.5 (feet)
Manufacturer: Myers Type: Sub H.P. 1/3
Type of plumbing (i.e., pitless): Top of Well
Other:

Obstructions: ☒ All obstructions removed:
☐ Pump, motor, drop pipe, wiring, & associated materials removed.
☐ Other:
☐ No obstructions were present in well at time of inspection.
☐ Not all obstructions removed. Provide explanation and how addressed during decommissioning in "Decommission Procedure" section.

Static Water Level: (Provide units for all measurements)
Water Level below (MP) (within approx. 10 min.) and time:
56.75 at 9:53 (time)
56.75 at 9:54 (time)
56.75 at 9:56 (time)
Date of water level measurements: 11/15/09
Elevation of MP above mean sea level: 67.49
MP Description: West side of PT well
MP Elevation above (+) or below (-) land-surface: 2.22'
Land-surface elevation above mean sea level: 67.27
Sources of MP and/or land surface elevation AND potential influences on water level: LiDAR - LNR Database + Tides

Water Quality: Water quality sampled? ☐ Yes ☐ No. If yes, attach results on separate sheet.
Water quality issues with well? (Provide sources): potential Saltwater intrusion

Well Production While In Service:
Typical production: Small Gpm (gal/min.)
Drawdown: (feet) after 5 hours
Recovery: (feet) after (provide units)
Source (measured, estimated, owner/operator, documented, verbal, attach additional information):
Maximum production: (gal/min.)
Drawdown: (feet) after hours.
Recovery: (feet) after (provide units)
Source (measured, estimated, owner/operator, documented, verbal, attach additional information):
Changes and causes in production over life of well?

Property Owner Name(s): Multipul

Location:
Well Street Address: 2985 Lummi Shore Rd Bellingham WA 98226
Section, Township, Range: NE 1/4-1/4 SE 1/4 Section 25 Township 38N Range 01E

Latitude/ Longitude: Lat N48.795131 Long W122.620396 (provide units to decimal degrees or minutes)
Source of latitude and longitude: LNR Database
☐ USGS Quadrangle Map ☐ High Resolution Aerial Image
☐ Conventional survey ☐ Mapping Grade GPS
☐ Global Positioning System (GPS) Survey ☐ Recreational Grade GPS
GPS Accuracy: ± NA feet
Aerial Image source: NA
Aerial Image resolution: NA (provide units)
Record datum if not WGS 84:

Tax Parcel No 380125350125 Assignment No. 60W

DECOMMISSION PROCEDURE

Document method(s) of well decommissioning, including, but not limited to, methods of placement of sealing material, sealing materials used, quantity of sealing materials used, locations of sealing materials, location and resolution of obstructions that could not be removed, and treatment of well and ground surface at and near the ground surface.
USE ADDITIONAL SHEETS IF NECESSARY.

Material	From (ft)	To (ft)
this well was excavated		
to establish a proper surface		
Seal to 18' and 14 bag 3/8 Chips		
3.90' of 6" casing was		
add with a locally		
Mfg Locking Well Cap		
to accomidate a Monitor		
probe storage.		
The Top of Casing is now 2.44		
feet above the original		
MP vs Top of		
Casing was 1.46' below		
MP		

Start Date: 11/15/09 Completed Date: 11/11/09

WELL DECOMMISSIONING CERTIFICATION: I decommissioned and/or accept responsibility for decommissioning of this well, and its compliance with all acceptable well decommissioning standards for the profession. Materials used and the information reported above are true to the best of my knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print): Bill Clothier	Drilling Company: B & C Well Drilling
Driller/Engineer/Trainee Signature:	Address: 888 Kelly
Driller or trainee License No: 0085	City, State, Zip: Bellingham WA 98226
If TRAINEE, Driller's Licensed No: **Driller's Signature:**	Contractor's Registration No: BCWELDP947JA Date: 12/22/09

The Lummi Indian Business Council does NOT warranty the Data and/or Information in this Well Decommissioning Report.

Well 65. U.S. Geological Survey Lummi test well 1. Drilled by Hayes, 1971. Casing: 6-inch to 87 ft. Screen: .020-inch slot, 87-92 ft; .010-inch slot, 92-97 ft. Well depth, 97 ft.

Silt, clayey, with sand and pebbles	12	12
Clay, silty, with layers of silt	8	20
Silt, clayey, with sand and pebbles	16	36
Sand and pebbles, with silt and clay	2	38
Gravel	1	39
Gravel and clay	4	43
Sand and gravel, with clay and silt	4	47
Silt, clayey	13	60
Sand, silty	3	63
Sand, fine	6	69
Silt and fine sand, with clay	6	75
Clay	11	86
Sand, fine and medium, with granules	9	95
Silt and fine sand, with coarse sand	8	103
Sand, medium and coarse, with pebbles	4	107
Sand, fine and medium, with pebbles	2	109
Clay at 109 ft	--	--

Well 66. Lummi Water District No. 2. Drilled by Hayes, 1964. Cased to 81 ft. Screen: .010-inch slot, 81-86 ft.

Loam, sandy, tan	3	3
Clay, brown	14	17
Clay, gray	19	36
Till, sandy, gray	27	63
Sand, silty, black	8	71
Sand and gravel, silty, brown	5	76
Sand, fine, brown (cleaner 81-86 ft)	10	86

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C line 1974

Well 71. Vina Bell. Dug by Ward Sharp, 1964. Casing: 36-inch to 32 ft.

Loam, sandy	2	2
Clay, gray	18	20
Hardpan	8	28
Clay, blue	4	32

Well 72. Verne Johnson. Dug 1946. Casing: 30-inch to 34 ft. Well depth, 30 ft.

Topsoil	1	1
Clay, hard, with gravel (hardpan)	24	25
Sand, black (water)	7	32
(Clay, hard, with gravel)?	10	42

Well 73. Georgia Manor Water Association. Drilled by Dean Kingsmore, 1959. Casing: 8-inch to 169 ft; perforated 164-169 ft.

Gravel	12	12
Clay, blue	12	24
Sand (dry)	52	76
Gravel	49	125
Sand, fine (water)	44	169

Well 74. Vernon Pratt. Drilled by Livermore, 1971. Casing: 6-inch to 133 ft. Screen: .025-inch slot, 133-138 ft.

Topsoil	2	2
Loam, sandy	3	5
Sand and fine gravel	17	22
Sand and gravel	58	80
Sand, fine	50	130
se, and a little fine gravel	7	137
	1	138

eonard Salisbury. Drilled by Livermore, 1969. 5-inch to 135 ft. Screen: 135-140 ft.

	2	2
vel	95	97
vel (water)	43	140

66 38N/01E-25J02

WATER WELL DECOMMISSIONING REPORT

Lummi Indian Business Council – Lummi Water Resources Division

Lummi Well No: 89 TRS Code: 37N/01E-02M03
Lummi Well Permit No: NA
Other Identification: NA
Well Log Attached? ☒ Yes ☐ No ☐ Not Available

Use of Well: ☐ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☒ Other: Community Water Supply

Reason for decommissioning: Abandoned

Dimensions of Well: Measured diameter of well 6 (in.) See Note
Measured depth of well 72 (ft.)

Construction/ Condition of Well: (MP = Measuring Point)
Casing material: Steel
Casing joint type: Welded
Surface seal present: ☐ Yes ☒ No ☐ Unknown
Surface seal condition: NA
Screen Interval: 63-70'
Pump and associated materials present? ☒ Yes ☐ No
Depth of pump intake from MP: 68.7 (feet)
Manufacturer: Berkeley Type: S.S. H.P. 1/2
Type of plumbing (i.e., pitless): See Note
Other:

Obstructions:
☒ All obstructions removed:
☐ Pump, motor, drop pipe, wiring, & associated materials removed.
☐ Other:
☐ No obstructions were present in well at time of inspection.
☐ Not all obstructions removed. Provide explanation and how addressed during decommissioning in "Decommission Procedure" section.

Static Water Level: (Provide units for all measurements)
Water Level below (MP) (within approx.10 min.) and time:
46.31 at 10:57 (time)
46.31 at 10:55 (time)
46.31 at 10:56 (time)
Date of water level measurements: 9/28/09
Elevation of MP above mean sea level: 58.96
MP Description: Top of Casing
MP Elevation above (+) or below (-) land-surface: +1.85
Land-surface elevation above mean sea level: 57.11
Sources of MP and/or land surface elevation AND potential influences on water level: LiDAR-LNR Database + Tides

Water Quality:
Water quality sampled? ☐ Yes ☐ No. If yes, attach results on separate sheet. See Well Log
Water quality issues with well? (Provide sources):

Well Production While In Service:
Typical production: See Well Log (gal/min.)
Drawdown: (feet) after hours.
Recovery: (feet) after (provide units)
Source (measured, estimated, owner/operator, documented, verbal, attach additional information):
Maximum production: (gal/min.)
Drawdown: (feet) after hours.
Recovery: (feet) after (provide units)
Source (measured, estimated, owner/operator, documented, verbal, attach additional information):
Changes and causes in production over life of well?

Property Owner Name(s): K. Zamora Trisha Mann
Location:
Well Street Address: 3230 Wekes LN Bellingham WA 98226
Section, Township, Range: NW 1/4-1/4 SE 1/4 Section 2 Township 37N Range 01E
Latitude/ Longitude: Lat N48.72187 Long W122.6541 (provide units to decimal degrees or minutes)
Source of latitude and longitude: LNR database
☐ USGS Quadrangle Map ☐ High Resolution Aerial Image
☐ Conventional survey ☐ Mapping Grade GPS
☐ Global Positioning System (GPS) Survey ☐ Recreational Grade GPS
GPS Accuracy: ± NA feet
Aerial Image source: NA
Aerial Image resolution: NA (provide units)
Record datum if not WGS 84:
Tax Parcel No. 370102128158 Assignment No. 68-1

DECOMMISSION PROCEDURE

Document method(s) of well decommissioning, including, but not limited to, methods of placement of sealing material, sealing materials used, quantity of sealing materials used, locations of sealing materials, location and resolution of obstructions that could not be removed, and treatment of well and ground surface at and near the ground surface.
USE ADDITIONAL SHEETS IF NECESSARY.

Material	From (ft)	To (ft)
This well had a pitless unit install with on with a removeable spool.		
Removed pitless unit perforated		
Casing from screen interval		
placed 2 bag 3/8 bentonite chips		
in screen filled casing with		
bentonite grout applied (11.5		
bags of Grout		
Pressure with drill Stem		
Topped off with	3/8	Chips
6 bags 3/8 chips		
to 2' below surface Capped		
with Top Soil		

Start Date: 9/22/09 Completed Date: 9/28/09

WELL DECOMMISSIONING CERTIFICATION: I decommissioned and/or accept responsibility for decommissioning of this well, and its compliance with all acceptable well decommissioning standards for the profession. Materials used and the information reported above are true to the best of my knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print): Bill Clothier
Driller/Engineer/Trainee Signature:
Driller or trainee License No: 0085
If TRAINEE, Driller's Licensed No:
Driller's Signature:

Drilling Company: B&C Well Drilling
Address: 980 Kelly
City, State, Zip: Bellingham WA
Contractor's Registration No: BCWELDP947P6 Date: 12/22/09

The Lummi Indian Business Council does NOT warranty the Data and/or Information in this Well Decommissioning Report.

- 89 37N/01E-02M03 -

Well 80. Jones Water Co. Drilled by Livermore about 1946 to 70 ft. Originally yielded 25 gal/min, but well kept plugging up with iron. Deepened by Livermore, 1968. Casing: 6-inch. Well depth (1972), 117 ft.

Topsoil	2	2
Sand and gravel, loose (dry)	8	10
Clay, hard, blue	21	31
Sand, fine, muddy, brown	23	54
Sand, fine to 10 percent coarse, gray (water)	13	67
Clay, blue, pieces of bark and wood on top	3	70
Clay, muddy, brown	20	90
Clay, blue	22	112
Sand, fine (water)	5	117
Clay, blue	78	195

Well 82. Gooseberry Point Water Association. Drilled by Livermore, 1968. Casing: 6-inch to 133 ft. Screen: .035-inch slot, 133-138 ft.

Topsoil	1	1
Sand and gravel (dry)	21	22
Clay, blue	21	43
Sand, brown (dry)	33	76
Sand (water)	10	86
Sand, fine, and some brown clay	10	96
Clay, blue	9	105
Sand, fine, muddy	12	117
Sand, fine (water)	6	123
Sand, medium	9	132
Sand, coarse	6	138
Clay, blue, at 138 ft	--	--

Well 83. Jones brothers. Drilled by Bezona, 1947. Casing: 6-inch.

Gravel (poor [quality] water)	16	16
Clay, blue	169	185

Well 89. Stanford Solomon. Drilled by B and C Well Drilling, Inc., 1973. Casing: 6-inch to 63 ft. Screen: .020-inch slot, 63-70 ft, no openings 70-72 ft.

Clay	2	2
Gravel and clay, with cobbles	4	6
Clay with pebbles	9	15
Clay with gravel	10	25
Gravel, cemented	12	37
Gravel, sandy	15	52
Sand with pebbles (wet)	4	56
Sand	7	63
Gravel, coarse, with sand (water)	1	64
Gravel, fine, sandy	3	67
Sand, coarse	3	70
Gravel, with silt and sand (dry)	2	72

Well 91. Sylvester George. Dug by Ward Sharp, 1964. Casing: 36-inch to 40 ft.

No record (topsoil?)	2	2
Clay, gray	10	12
Clay, blue	18	30
No record	10	40

Well 94. James Barber. Drilled by Livermore, 1946. Casing: 4-inch to 38 ft.

Soil	1	1
Clay, blue, with boulders	24	25
Clay with thin sand beds	5	30
Sand, very fine	8	38

Well 96. E. P. McAllister. Drilled by Livermore, 1970. Casing: 6-inch to 54 ft. Screen: .035-inch slot, 54-59 ft.

Topsoil	1	1
Hardpan	13	14
Clay, blue	13	27
Clay, blue, sand and gravel	4	31
Sand, fine, and blue clay	3	34
Sand, fine (water)	25	59
Clay, blue, at 59 ft	--	--

[redacted]

63

Cline 1974

Roberts & Solomon

PORTLAND AREA INDIAN HEALTH SERVICE
P.L. 86-121

WELL LOG

760
Home No.: 762

Well Owner: Lummi Housing Authority
Location: Lummi View Road, Lummi Reservation, Whatcom Co.
Drilled By: B & C Well Drilling, Bellingham, WA Date: Novem. 1972
Project No.: WASH. 28-2, PO-73-301 Contract No.: See Lummi Housing Authority records.

Depth:			Description of Formation:
0	to	2	clay
2	to	6	gravel, clay with cobbles
6	to	15	clay with pebbles
15	to	25	clay with gravel
25	to	37	cemented gravel
37	to	52	sandy gravel
52	to	56	wet sand with pebbles
56	to	63	sand
63	to	64	coarse gravel with sand and water
64	to	67	fine sandy gravel and water
67		70	coarse sand and water
70		72	SIZES AND MATERIALS USED dry gravel with silt and sand

All Depths Measured from Top Surface of Well Slab

Top Casing Line: Nominal I.D. 6" Material steel
Depth Cased 0 ft. to 63 ft. Wt/ft 17.02 ft.

Any Reduced Casing Sizes:

Grout Envelope: Thickness 1 in.
Depth Grouted 2 ft. to 11 ft.

Pitless Adapter: Make Monitor Model
Depth of Discharge 2 ft. CAP Type

Well Screen: Make Johnson Model
Type stainless steel
Diameter 5 in. Length 7 ft. Slot .020 in.
Depth Screened 63 ft. to 70 ft. Slot in.
ft. to ft. Slot in.

Spacer(s)
Fitting at Top 3' blank riser
Fitting at Bottom 2' blank bottom
Packer Description lead

Gravel or Sand Pack: Material
Thickness in. Depth ft. to ft.

(Attach Gradation Curve)

Total Depth to Bottom of Well 70 ft.
Total Depth to Bottom of Casing 63 ft.
Total Depth to Bottom of Drop Pipe 63.5 ft.
Total Depth to Pump Inlet 65 ft.

PUMP DATA by Hayes Well Drilling, Bow, WA

Pump Type: submersible Manufacturer Stavite
Model No. CP4B2-13 Size (Diameter) 4 in. Length 36 in.
Series H74 GPM Serial No. _____
Motor Type: _____ Make _____
230 volt 5.2 amp 3 wire 1 phase 1/3 H.P.
Serial No. _____
Drop Pipe: Nominal I.D. 1 in. Material galvanized
Length 61.5 ft. Wt/ft _____ lb.

Pump Test Data by B & C Well Drilling, Bellingham, WA

Static Water Level: 44.7 ft.
Pumped at 4.5 gpm for 5 hours with a resulting drawdown of 18.3 ft.
Bacteriological Test: Safe _____ Unsafe _____
Date _____ Date _____
Chemical Test: YES (X) NO ( )

NOTES: pumping at 6.7 gpm produced aeration; recovery not reported by contractor.

DRAWINGS

NOTES

The water supply system also consists of 2 jet pumps (Berkeley, 1/3 HP, 115 V, 6.0 AMP, PH. 1, type CS) that pump from a 1200 gallon cistern into a battery of 204 W-X-Trol pressure tanks. B/W liquid level controls installed with 10' operating differential. 4 GPM flow valve. Also, B/W controls set in the cistern for the submersible pump operation.

(Attach any available information on materials and equipment, pump performance curves, pump test data (drawdown and recovery), and any other pertinent data.

Mailing Address:
P. O. Box 3118
St. Paul, Minn. 55165

SAND ANALYSIS

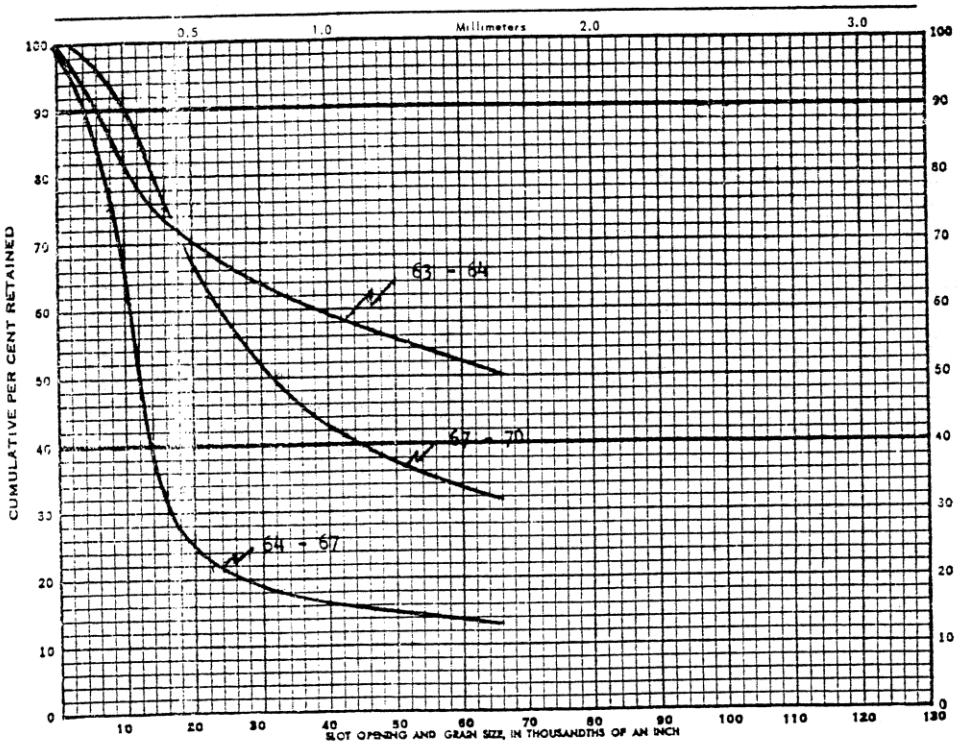
Johnson Division
Universal Oil Products Co.
1950 Old Highway 8
Saint Paul, Minnesota

Data sent in by B & C Drilling

Town Bellingham State Washington Date 30 Oct. 1972

From well of

Remarks USPHS, Indian Health Div. SWL = 45 feet



SIEVE OPENINGS	CUMULATIVE PER CENT RETAINED		
	63 - 64	64 - 67	67 - 70
.132			
.094			
.066	51	12	
.047	7	15	41
.033	67	12	1
.023	67	2	1
.016	74	3	7
.012	81	2	27
.008	87	75	74
.006			

Notes: Wants 20 gpm

Recommended Slot Opening: 20

Recommended Screen: Dia. 6 in. Length 7 Ft.

By: RLS

SO MANY CONSIDERATIONS ENTER INTO THE MAKING OF A GOOD WELL THAT, WHILE WE BELIEVE SLOT SIZES FURNISHED OR RECOMMENDED FROM SAND SAMPLES ARE CORRECT WE ASSUME NO RESPONSIBILITY FOR THE SUCCESSFUL OPERATION OF JOHNSON WELL SCREENS

W. ? SAMPLE INFORMATION FOR CHEMICA \NALYSES NOV 13 1972

SYSTEM I.D. NUMBER

SYSTEM NAME	COUNTY	COUNTY NO.	COLLECTED BY
Soloman (PROPOSED)	Whatcom	37	R. Chatfield

DATE COLLECTED	TIME COLLECTED	DATE LAST SAMPLE	TAKEN FROM
11-3-72	2:00 PM		☒ PUMP ☐ STORAGE TANK ☐ FAUCET ☐ HYDRANT ☐ OTHER (Specify)

SOURCE (Name) ☐ LAKE ☒ WELL ☐ OTHER (Specify) ☐ STREAM ☐ SPRING

SAMPLE COLLECTED FROM PUBLIC WATER SYSTEM AT: Lummi Rsv 5 miles N of Bellingham

FIELD TESTS: pH | TEMPERATURE | ALKALINITY

THIS WATER IS ☐ FILTERED ☒ UNTREATED ☐ OTHER TREATMENT

REMARKS

SEND REPORT TO:

Geoff Kefler
c/o Indian Health Service
1212 - S. Judkins
Seattle, (City) Washington 98144 (Zip)

State of Washington
DEPARTMENT OF SOCIAL AND HEALTH SERVICES
HEALTH SERVICES DIVISION
Smith Tower, Seattle, Washington 98104

		[1] mg/l	[2] me/l			[1] mg/l	[2] me/l
Silica	(SiO_2)	8.30		[3] Bicarbonate	(HCO_3)	292.80	4.80
Aluminum	(Al)			Carbonate	(CO_3)		
Iron	(Fe)	.18					
Manganese	(Mn)	.012		Sulfate	(SO_4)	34.5	.72
				Sulfite	(SO_3)		
				Chloride	(Cl)	27.0	.76
Calcium	(Ca)	42.4	2.11	Fluoride	(F)	.1	.01
Magnesium	(Mg)	38.39	3.15	Nitrate (NO_3) as Nitrogen (N)		.03	
Sodium	(Na)	23	1.00	Nitrite (NO_2) as Nitrogen (N)		.011	
Potassium	(K)	4	.10	Phosphate	(PO_4)	.06	
TOTAL			6.36	TOTAL			6.29

			[1] mg/l
pH, Lab	7.7	Suspended Solids	
Specific conductance (Micromhos/cm, 25° C)	460	Dissolved Solids	
Turbidity (JTU)	.6	Total Solids	
Color (units)	5	[4] Total Solids	322
Odor (threshold dilution factor)	Nil	Total Hardness ($CaCO_3$)	264
Taste (threshold dilution factor)		[4] Alkalinity ($CaCO_3$)	240
[4] Free CO_2 (mg/l)	12.0	[4] Noncarbonate hardness ($CaCO_3$)	24
		[4] Calcium hardness ($CaCO_3$)	106
		[4] Magnesium hardness ($CaCO_3$)	158
		[4] Calculated hardness ($CaCO_3$)	264

DATE RECEIVED	DATE COMPLETED	COMPLETED BY	LAB NO.
11-10-72	11-13-72	JS OW	980

[1] mg/l = ppm (parts per million)
[2] me/l = epm (equivalents per million)
[3] Converted to CO_3 when calculating total solids
[4] Calculated values

HEA-175-A (R-1) 2-72

DIRECTIONS FOR COLLECTING WATER SAMPLES

1. Normally, chemical samples may be collected in any gallon-bottle, preferably plastic to avoid breakage (for example, bleach bottles). Bottles that have contained petroleum products or solvents should not be used, however. Rinse the bottle and cap thoroughly to remove any trace of its former contents. Fill and cap the bottle, complete the front-side of this form, and ship or deliver the bottle and form together to the Department of Social and Health Services, Division of Health, Smith Tower, Seattle, Washington 98104.

2. If the sample is to be tested for the presence of hydrogen sulfide (H_2S) a special bottle must be obtained from the Division of Health.

Following are limits established in the RULES AND REGULATIONS OF THE STATE BOARD OF HEALTH RELATING TO PUBLIC WATER SUPPLIES. For public water supplies, values reported on the reverse side of this form are not to exceed these limits. Since these standards are based on public health considerations, private supplies are also advised to remain below these limits.

Turbidity (Jackson Turbidity Unit)	5 units for unfiltered water 1 unit for filtered water
Color	15 units
Threshold odor number	3
Iron (Fe)	0.3 mg/l
Manganese (Mn)	0.05 mg/l
Sulfate (SO_4)	250.0 mg/l
Chloride (Cl)	250.0 mg/l
Fluoride (F)	2.0 mg/l
Nitrogen (N) (nitrite plus nitrate)	10.0 mg/l
Total Dissolved Solids (TDS)	500.0 mg/l

Following is a generally accepted classification of hardness. In general, water having a hardness of less than 100 mg/l is not considered hard for ordinary domestic use.

Soft	0 - 60 mg/l
Moderately hard	61 - 120 mg/l
Hard	121 - 180 mg/l
Very hard	181 mg/l and over